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Only three or four cities showed improvement, the most marked being St. Louis.

In studying these facts, there seems to be no escaping the conclusion that infant mortality in the large cities is largely on the increase, but it is probable that meteorological conditions may have affected the statistics, *e. g.*, it was perhaps wetter in 1890 than in 1880. However, on examining the causes of mortality for the two years, we get clearer evidence. 1890 shows a decided increase in 'inanition,' and also 'debility and atrophy.' There is also a marked increase in bronchitis and pneumonia. There is a decrease in convulsions and also in cholera infantum as compared with 1880.

(3) It appears that the colored have an almost uniformly higher death-rate than the whites; and this, as a general rule, is no doubt true; but the negro is known to be less susceptible to malaria than the white, yet, owing to his mode of life, his mortality from this cause is much greater in the cities discussed. Again, it appears from the tables that the death-rate of the native whites is greater than that of the foreign whites in most cities, but, as Dr. Billings points out, this must be connected with the fact that the native whites include a much larger proportion of young children. It is interesting to note that in New Orleans the death-rate of the foreign whites was much greater than in any other of the cities, while that of the native whites was less than in many of the cities. In connection with this we observe that the death-rate from malaria in New Orleans was more than double that in any other of the cities, and that it was much greater among the foreign whites; hence it is fair to assume that the native whites of New Orleans exhibit the results of evolution against this disease.

It may be here remarked that the mortality from typhoid fever was greater in the great cities of the United States than in those of England, France or Germany; and in the United States the foreign-born suffered markedly more from this disease than the native-born. Hence perhaps we may assert that the natives of the United States exhibit the results of evolution against typhoid an evolution more marked than that of European nations.

The death-rate of the colored from consump-

tion was more than twice as great as that of the whites. Curiously, it was about twice as great among the children of mothers born in Ireland as among those of mothers born in Germany, and more than three times as great as among those of mothers born in the United States. This may be largely due to the manner of life of the Irish, but it does appear that they are naturally more susceptible to this disease than Germans or Americans. Erroneous conclusions might be drawn from the fact that Denver has a much higher death-rate from consumption than Pittsburg or Kansas City, did we not remember that very many consumptives go to Denver and die there.

In another part of the book are given colored maps of the cities, showing by different degrees of shading the death-rates in the several wards. Information is also given which enables one to form some opinion as to the causes of the remarkable differences between the healthfulness of the wards in all of the cities. These and many other matters might be discussed at length, but enough has been said to show that Dr. Billings' volume should be of great value not only to social reformers, but also to biological students. It may be that in the study of the facts these different classes of individuals will find a common ground, and the teachings of science will ultimately be heard in no uncertain way from the political platform, setting forth truths which will surprise many comfortable and self-satisfied individuals.

T. D. A. COCKERELL.

MESILLA, N. M., June 25, 1897.

GEOLOGIC ATLAS OF THE UNITED STATES.
FOLIO 24, THREE FORKS, MONTANA, 1896.

THIS folio, by Dr. A. C. Peale, consists of 5 pages of text, a topographic sheet (scale 1:250,000), a sheet of areal geology, one of economic geology, one of structure sections, and one giving a generalized columnar section for the district.

The area covered comprises the square degree which lies between the meridians 111° and 112° and the parallels 45° and 46°, in the southwestern, mountainous portion of Montana, and includes 3,354 square miles. In the extreme

southeast corner the Yellowstone National Park barely falls within the area. The folio derives its name from the valley in which the Jefferson, Gallatin and Madison rivers unite to form the Missouri. The 'Three Forks' Valley is important from an historic standpoint, as being the point which Lewis and Clark reached in July, 1805, when they named the three confluent branches of the Missouri.

The text begins with a general description of the geography and topography of the region, and then takes up the general geology. The oldest rocks in the region are the crystalline schists and gneisses, designated as of Archean age, which in pre-Cambrian time formed a land mass comprising nearly all the area included in the map. While the Algonkian beds were being deposited to the extent of from 6,000 to 12,000 feet, there was a gradual subsidence of the whole region, and shallow seas for the most part prevailed. During the Paleozoic age there were many minor oscillations of the surface, which were more frequent during Cambrian time than during the deposition of the Devonian and Carboniferous limestones. Toward the close of the Cretaceous period a general elevation began, which was accelerated after the deposition of the Laramie formation. The formation of the mountain ranges, together with the subsequent erosion, resulted in many valleys, which eventually were occupied by fresh-water lakes. These lakes attained their greatest extent in the Neocene period, lasting in all probability until the Pleistocene period was well advanced, and during their earlier stages immense bodies of wind-carried volcanic dust were deposited in their waters, and are now seen as beds of pure white dust. At the same time the dust fell upon the surrounding country, from which it was afterward washed into the lakes, forming an upper series of yellowish and rusty-colored beds. These dust showers destroyed both animal and vegetable life, and the remains carried into the lakes were buried in their deposits, where they are now found as fossil bones and opalized and silicified wood.

Under the 'Description of Rock Formations,' are outlined all the formations from the Archean gneisses up through the Algonkian, Cambrian, Devonian, Carboniferous, Juratrias, Cretaceous,

Eocene, Neocene and Pleistocene. The rocks of more than half of the area are of sedimentary origin, while the crystalline rocks occupy approximately 1,000 square miles, the remaining third of the area being covered with igneous material. Prominent among the latter are the andesitic breccias which form the main part of the Gallatin Range, the great porphyritic laccolite occupying the center of the Madison Range, and the basaltic plateau which lies west of the Madison Valley.

Under the heading 'Structural Geology,' after a general consideration, the vertical and horizontal movements are discussed, and the development of the lake basins is described. The arrangement of the rock masses is complex, the structure being complicated by laccolites, dikes and surface flows of igneous material. Unconformities exist, showing that areas previously raised to land surfaces and worn down have subsided, have been crossed by an advancing shore, and later have passed beneath the sea.

The lake basins are now the floors of extensive valleys separating the detached mountain ranges, which rise about 6,000 feet above their bases. As the lake deposits are at least 2,000 feet in thickness, the difference of elevation between the bottoms of the lake basins and the summits of the peaks must be at least 8,000 feet. The region was a mountainous one before the development of the lakes; but in the evolution of the existing relief, movements and erosion have both operated to accent the topographic differences.

The principal economic resources of this region are gold, silver, iron ore, copper, limestone and coal. The occurrence of coal in Devonian rocks on the north side of Jefferson Cañon is of geologic interest, although not of much economic importance. The fine pumiceous volcanic dust found in the old lake basins has been utilized to a very limited extent as a polishing material. Brick clays occur and are used to a small extent in a number of localities, especially near Bozeman. In addition to the economic resources just referred to, the sheet of economic geology has indicated upon it the localities of building stone and mineral springs.

GEOLOGIC ATLAS OF THE UNITED STATES.
FOLIO 30, YELLOWSTONE NATIONAL
PARK, WYOMING, 1896.

THE Yellowstone Park folio, recently issued, consists of six pages of descriptive text, three pages of illustrations, four topographic sheets (scale 1:125,000), and four sheets delineating the areal geology of the region.

The general descriptive text, giving a succinct narrative of the geological history and development of the Park country from the time of the earliest continental land surfaces up to and including the hydro-thermal phenomena as seen to-day, was written by Arnold Hague, geologist in charge. It is followed by an account of the sedimentary rocks from the earliest Cambrian deposits to the Tertiary conglomerates, by Walter Harvey Weed, and a detailed petrographical description of the igneous rocks, by Joseph Paxson Iddings.

The area of country covered by the Yellowstone National Park folio lies between parallels 44° and 45°, and meridians 110° and 111°. It is situated in the extreme northwest corner of Wyoming. By far the greater part of the Park is included within the area of the four atlas sheets, but a narrow strip lies to the northward in Montana, and a still narrower strip extends westward into Idaho and Montana. In the organic act establishing the Park, Congress declared that the reservation was 'dedicated and set apart as a public park and pleasure ground for the benefit and enjoyment of the people.' Owing to the marvelous display of geysers and hot springs of the region, and such remarkable physical features as the Grand Cañon and Yellowstone Lake, this folio possesses more than ordinary interest to geologists.

The central portion of the Yellowstone Park is a broad volcanic plateau with an average elevation of 8,000 feet, surrounded on nearly all sides by mountains rising from 2,000 to 4,000 feet above its general level. The continental watershed crosses the Park, separating the waters of the Atlantic from those of the Pacific, the Missouri and the Columbia, by the way of the Yellowstone and the Snake, finding their sources on this plateau.

The oldest rocks of this region are granites, gneisses and schists regarded as of Archean

age. They occur in all the mountain uplifts that encircle the Park, but are unknown in the central portion. Around these ancient continental land masses there was deposited a conformable series of sandstones, limestones and shales, extending from the time of the middle Cambrian, the lowest beds exposed through the upper Cambrian, Silurian, Devonian, Carboniferous, Juratrias and Cretaceous, including the Laramie sandstone. Nearly every one of these great divisions of Paleozoic and Mesozoic time is characterized by a typical fauna. With the close of the deposition of the Laramie sandstone the conformable series of sediments came to an end. The entire region was elevated above the sea, the elevation being accompanied by plication and folding of strata. This primary orographic uplift which blocked out the main ranges of the northern Rocky Mountains has been designated the post-Laramie movement.

Tertiary sedimentary rocks occupy only small areas in the Park, the greater part of the region being covered by extensive flows of lava. A heavy mass of coarse conglomerate, designated the Pinyon conglomerate, has been referred to the Eocene, and Pliocene conglomerate and coarse sands are well exposed in the escarpments of the Grand Cañon.

Volcanic energy, which has played a great part in the geological development of the country, was connected with the post-Laramie movement and followed closely upon the elevation of the mountains and the accompanying dislocation and compression of strata. The eruptive masses in forcing their way upward sought egress along lines of least resistance, or wherever strain had been greatest in the crumpled sediments. Volcanic outbursts continued on a grand scale throughout Tertiary time.

During the Eocene and Miocene periods enormous volumes of fragmental ejectamenta, largely composed of andesitic breccias, were thrown out. The Absoraka Range was almost wholly built up of volcanic material. Evidence of this long-continued action is shown in the well-preserved fossil floras of Eocene and both lower and upper Miocene age. The famous fossil forests of the Yellowstone are of Miocene age. After a period of great erosion the depressed basin lying between

the encircling ranges was transformed into the present Park Plateau by the extravasation of immense flows of rhyolite of Pliocene age. Still later the recent basalts, the last of the igneous extrusions, poured out over the rhyolite along the ridges of the plateau. A vertical section accompanies the text, showing the order of succession of the extrusive flows from the earliest outbursts to the final dying-out of eruptive energy. It is shown that long-continued currents of heated waters and acid vapors have acted as powerful agents in decomposing the igneous rocks of the plateau, and date back to Pliocene time; at least they were active before glacial ice covered the country. Hot springs, geysers and solfataras are closely associated with the rhyolite, and in fact thermal activity is confined almost exclusively to areas of this rock.

The illustrations relate mainly to the occurrence of both active and dormant geysers and hot springs, or some phase of volcanic geology. The Grand Cañon, well shown in the illustrations, is a profound gorge cut in the Pliocene rhyolite, the brilliant coloring being due to the action of thermal waters.

An Illustrated Flora of the Northern United States, Canada and the British Possessions. By NATHANIEL LORD BRITTON and HON. ADDISON BROWN. Volume II. Portulacacæ to Menyanthacæ. New York, Charles Scribner's Sons. Pp. 643. \$3.00.

The elaborate review of the first volume of Britton and Brown's 'Illustrated Flora of the Northern United States,' which was given by Professor Conway MacMillan in SCIENCE, renders necessary only a brief notice of the second volume, which has now appeared.

Following the Engler and Prantl sequence, the first volume was made up chiefly of the monocotyledonous plants, which, compared with the other large groups of flowering plants, are probably the least attractive. In the present volume are included such large and well-known families as the Pink family, Crowfoot family, Mustard family, Rose family, Pea family, Carrot family, and the Heath family. As a whole the volume exceeds in interest and attraction the earlier one.

In running through the book a leading feature of excellence impressed upon one is that there are brought together here for the first time in a systematic manner the results of all the recent scattered special papers on our North-eastern plants. For example, the critical work done in the past few years on *Amelanchier Canadensis*, *Cardamine hirsuta*, *Ranunculus repens* and *Agrimonia Eupatoria* is here found carefully collated and systematized, full consideration being given to the conclusions of those who have done the work and whose opinions are therefore most to be depended upon.

A liberal view has been maintained regarding the delimitation of species, the work in this respect standing alone among our recent manuals. There has been a tendency among our manual writers, in case of any difficulty in the definition of specific types, to follow the antique British method of giving up any attempt at segregation and putting a number of diverse forms under one name. The results of the endeavor to give full consideration to valuable critical work is exceedingly gratifying, and will certainly serve to encourage in botanists habits of close observation on our supposedly well-known Eastern flora. No better example of judicious segregation could be cited than the separation from the old *Ranunculus repens* of three additional species, *R. septentrionalis*, *R. hispidus* and *R. macounii*.

In the matter of generic treatment this volume gives a similar impression of liberality, the limitation of genera corresponding very closely in this work with that of continental European authors. As extreme examples of the extent to which the generic segregation has been carried may be cited *Oenothera*, which is here divided into eleven genera. It is clearly a recognized principle throughout the work not merely that a genus is a group which can always be recognized by some one or more invariable technical characters fitting nicely in a key, but that it is a group of plants which resemble each other in what is perhaps best represented in English by the word *style*, and that the question of an arbitrary mark, as it were, is of secondary, not of primary importance.

The drawings, for which the book is most likely to be criticised by botanists of critical

training, are usually excellent, and to the ordinary student, for whose guidance they were evidently more especially intended, they must always prove valuable. The drawings of the violets, for example, are excellent and helpful representations of the different species of that group. In the case of the genus *Myriophyllum* in which the drawings have less of sharpness and more of the character of sketches, the species, which everyone has had difficulty in understanding from mere descriptions, can be readily recognized from the drawings.

Probably the principal fault in the general make-up of the work lies in the separation of the Latin and English indexes, a system which if carried through the third volume would sometimes make it necessary for one unfamiliar with botanical names to look in six different indexes in order to find a particular plant. It is to be hoped that the third volume will contain a single combined Latin and English index to all three volumes.

The impression is strengthened by this second volume that this work marks an epoch in the development of systematic botany in America, combining, as it does, the best of the new ideas which have been current in this country for twenty years and which had their source in the new method of systematic research in which the younger generation had been educated, based on the Darwinian ideas of genetic development.

F. V. COVILLE.

SCIENTIFIC JOURNALS.

TERRESTRIAL MAGNETISM FOR JUNE.

THE first article, by Dr. J. A. Fleming, on 'The Earth a Great Magnet,' gives a popular exposition of the principal phenomena of the earth's magnetism. For many years it has been the custom to have a popular experimental or illustrated lecture delivered during the meeting of the British Association for the Advancement of Science, addressed especially to the artisans of the town in which the meeting takes place. This article gives the text of the discourse delivered by the author before the workmen of Liverpool at the last meeting of the British Association. Dr. Fleming's most admirable lecture was profusely illustrated by ex-

periments, and was presented before a very large audience in the Picton Hall. It appears in *Terrestrial Magnetism* in full for the first time.

Professor McAdie reviews and summarizes the present state of our knowledge with regard to 'The Electrification of the Atmosphere,' as set forth in the recent publications of Chree, Elster, Geitel and Schuster. The author thinks that there are good grounds for believing that the twentieth century will number among its triumphs a complete electrical survey of the atmosphere. He regards the question as to the relation between the magnetic elements and the atmospheric electric currents as the coming one.

Mr. Littlehales gives an abstract of his recent researches with respect to the establishment of 'Secular Variation Expressions of the Magnetic Inclination.' This investigation is preparatory to a future article which will give the secular change in the direction of a freely suspended magnetic needle at each of twenty-two stations distributed over the globe.

Dr. Bauer, in the next article, 'A Remarkable Law,' presents formulæ giving the diurnal range of the magnetic declination and inclination as simple functions of the magnetic inclination. The formulæ were first found empirically and then deduced theoretically by assuming that the component of the deflecting force producing the angular deflection of the needle from its mean position is inversely proportional to the force exerted on the needle by the earth's permanent magnetism. The formulæ would imply that the lines of equal magnetic inclination represent closely the lines of equal diurnal range. The author finds that the same functions hold with regard to some of the secular and distribution phenomena of the earth's magnetism.

In 'Letters to Editor' is a communication from Professor Hellman regarding Stevins's 'AIMENTPETIKH,' another from Dr. van Bemmelen discussing the non-cyclic phenomena of the diurnal variations, and a third from Drs. von Rijckevorsel and van Bemmelen giving the results of their magnetic observations on the Rigi, made in 1895 and 1896.

Abstracts, Reviews, List of Publications and Notes close the number.